translation (*i.e.*, while the workpiece is within the volume). This allows for the formation of a complex honed edge on the workpiece and allows controlled variation of the hone along the workpiece edge. Referring to Figure 16 and Figures 17A-17C, for example, there is shown a threading tool 220 having a hone on the thread forming edge 222 that is varied from the tip end 224 to the base 226 of the thread forming edge of the tool. Referring to Figures 17A, it may desirable at the tip end 224 to have a larger hone to permit the thread forming edge 222, when in use, to dig through the raw material. Conversely, at the base 226 of the thread forming edge 222, shown in Figure 17B, it may be desirable to have a sharper hone to permit more precise finishing of the threads in the material. Figure 17C shows the hone formed at an intermediate point 228 along the thread forming edge 222. The present invention allows such precise hone control over the finished workpiece.--

REMARKS

The drawings have been amended. Attached hereto are two sheets of corrected drawings with proposed changes shown in red. Also attached hereto is one sheet of new figures. Figure 1 has been amended to schematically illustrate a controller 200, as required by the Examiner, for controlling various components of the honing apparatus 10 as described in the specification. Figure 6 has been amended to add reference number 84 to identify the screw of the vertical movement mechanism 28. Figures 16 and 17A-17C have been added, as required by the Examiner in paragraph 1 of the office action, to show a thread forming tool having a honed edge that varies along the edge between a tip end and a root end. Support for this amendment appears in the original claims and in the specification at page 13, lines 17-28. No new matter has been added by the amendment to the drawings.

The specification has been amended at pages 7, 9 and 11 in response to objections to various reference numbers in the drawings as set forth in paragraphs 2-4 of the office action. The amendment of the specification overcomes the objections to the drawings and, therefore, obviates the requirement of paragraphs 2-4 for corrected drawings. No new matter has been added by the amendments to the specification.

ARGUMENTS

Objection to Specification

The Examiner objects to reference numbers 128 and 131 and has required that these numbers be replaced respectively with numbers 126 and 128. (See paragraph 5 of the

office action). Although there is no explanation for the objection, it is presumed that the Examiner considers the item marked as 131 to be the horizontal movement mechanism (128) and the item marked as 128 to be the translational movement mechanism (126). However, this is not correct.

Referring to Figure 7 (which generally depicts an embodiment of these components) and the associated description at pages 10-11 of the specification, the translational movement mechanism 126 is driven horizontally along guides 136 for movement of the workpiece 122 in a first horizontal direction. The horizontal movement mechanism 128, in turn, is translatable with respect to mechanism 126 to provide movement of the workpiece 122 in a second horizontal direction that is substantially perpendicular to the first horizontal direction (i.e., toward and away from the brush 20 in the figure.) The vertical movement mechanism 131 is designed to provide vertical movement of the workpiece 122 with respect to both mechanisms 126 and 128. It is respectfully submitted that Figure 7 and the accompanying text properly refer to the various movement mechanisms. As such, withdrawal of the objection to the specification set forth in paragraph 5 of the office action is respectfully requested.

§112 Rejections

The office action includes a rejection of claims 38-64 under Section 112 for lack of description in the specification and for indefiniteness. (See paragraphs 7 and 9 of the office action.) The Examiner asserts that the claim limitations of a "cutting edge that extends from a tip end to a root end" (claim 38) and a "hone shape that varies continuously along the cutting edge" are not shown and described. As discussed above in regard to the required additional figures showing one embodiment of the claimed tool, the specification at page 13, lines 17-28 describes a thread forming tool having a honed cutting edge that varies along the edge between a tip and a base of the tool edge. This section provides complete support for the claimed features recited in the claims and particularly claim 38, 41 and 43. Proposed Figures 16, and 17A-17C are being provided to visually depict that which is recited on page 13 of the specification.

Furthermore, the present application is a divisional application of Serial No. 09/428,726. This divisional application includes original claims 38-42 from the parent application. Those claims are, by definition, part of the specification as originally filed. As such, those claims provide support for the inclusion of the invention directed to claims 38-64.

Based on the foregoing, it is respectfully requested that the rejection of claims 38-64 under Section 112 is not proper. The application provides express support for the limitations of the various independent and dependent claims. Reconsideration and withdrawal of the rejection is solicited.

§102 Rejection

The Examiner has rejected claims 38-64 as anticipated by U.S. Pat. No. 5,876,160 to Johnson. Each of claims 38-42 from the parent application requires a tool including a cutting edge that has a hone that varies between a tip end and a root end of the edge. Each of claims 43-58 requires a tool including a cutting edge that has a hone that varies between a first and second end of the cutting edge.

Johnson '160 discloses a cutting tool insert (52; Fig. 5) having a cutting edge (60). The cutting edge includes a land (64) formed thereon. The Examiner has taken the position that the land (64) of Johnson '160 is a "hone" (see page 6 of the office action). The Examiner also asserts that land (64) of Johnson '160 includes a "hone shape [that] varies continuously along the cutting edge." It is respectfully submitted that both of the above-mentioned assertions regarding Johnson '160 are erroneous.

As is well known in the art, a "land" is distinct from a "edge hone". As shown in Figure 8B-2 of Johnson '160, a land formed at the junction of two non-parallel surfaces creates a faceted surface having sharp edges at each of opposite sides of the faceted surface where the land intersects the original surfaces. In contrast, an edge hone (as shown in Figures 3B and 3C of the present application) is not a faceted surface having sharp edges. Instead, a hone provides an even or smooth transition between adjacent surfaces without any sharp edges.

Furthermore, the land (64) of Johnson '160 does not have a "hone shape" that varies along the cutting edge. As discussed above, the land (64) of Johnson '160 is a faceted surface rather than a shaped surface. Johnson discloses that the "width" of the faceted surface varies along its length being at a minimum at its opposite ends and a maximum at an intermediate point. Such dimensional variation (*i.e.*, the changing width), however, is not a shape change. The land is still a land, only narrower at one end. As described in the present application and illustrated in the figures, a honed edge, on the other hand, can be varied in its shape.

For at least the foregoing reasons, Johnson '160 does not show structure that is comparable to the structure required by claims 38-58. In addition, claim 40 requires that the cutting edge having tip and root ends is a thread forming edge of a threading tool. Johnson '160 does not show structure that is comparable to the required structure.

For the foregoing reasons, Johnson '160 does not anticipate claims 38-58.

Referring now to claims 59-64, each of these claims requires a cutting tool having a plurality of cutting edges each including a hone formed on it that has a magnitude that is different than the magnitude of the hone on at least one other edge. Claims 59-64 have been included in the anticipation rejection based on Johnson '160. The above-mentioned requirements of these claims, however, are not discussed. Johnson discloses that the cutting tool insert (52) is triangular. Each side of the triangle includes a main cutting edge (60) having a faceted land (64) formed thereon. Johnson discloses similarly formed edges on which "the preferred width of land midway along a main cutting edge (FIG. 8A) is approximately 0.011 inches, and at its juncture with the wiping edge (FIG. 8B) narrows to a width of approximately 0.005 inches". As such, Johnson '160 does not show structure that is comparable to the structure required by claims 59-64. Therefore, it is respectfully submitted that Johnson also does not anticipate claims 59-64.

For the foregoing reasons, the rejection of claims 38-64 based on Johnson '160 is improper. It is respectfully requested that the rejection be reconsidered and withdrawn.

The present application is believed to be in condition for allowance, which is hereby requested.

Respectfully submitted,

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AMENDMENTS WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

On page 7, the paragraph beginning "As described above" has been rewritten as follows:

--As described above, during operation, the contact between the bristles of the brush and a workpiece causes the bristles to heat up. In order to reduce the temperature of the bristles 66, one embodiment of the present invention incorporates an impeller 62 in the hub that has a series of vanes designed to draw air into the hub 60 through an air intake 64. The impeller [66] 62 forces air out through the bristles 66 of the abrasive brush 20, thereby reducing their temperature.--

On page 9, the paragraph beginning "As shown in FIG. 1" has been rewritten as follows:

--As shown in FIG. 1, a vertical movement mechanism 28 is employed which adjusts the vertical position of the motor [20] 24 relative to the base. In one embodiment, the vertical movement mechanism 28 includes a screw driven actuator that is controlled either manually, as by a handle 46 (FIG. 1), or by a control motor 80 (FIG. 6). If a control motor 80 is utilized, the motor 24 is preferably engaged to one or more guide rails [84] 82 through linear bearings 86. A screw [82] 84 turned by the control motor 80 passes through a threaded fitting on the motor 24, such that rotation of the screw [82] 84 causes the motor 24 to move up or down. It is contemplated that the movement of the motor 24 and abrasive brush 20 may be pre-programmed into a computer or other control device (such as the controller 200) to provide automated and repeatable workpiece honing.--

On page 11, the paragraph beginning "A further embodiment" has been rewritten as follows:

--A further embodiment of the invention is shown in FIG. 8. In this embodiment, a mechanism for controlling the distance between [the] a workpiece 122 [edge 50] and the axis of rotation 144 of the abrasive brush 120 is incorporated into the apparatus 10. Referring to FIG. 9, the position of [the workpiece] an edge 150 of the workpiece 122 relative to the abrasive brush 120 is shown. The orientation of the workpiece edge [50] 150 is defined by the angle δ between

a side surface 168 of the workpiece 122 and a radial line 170 extending from the axis of rotation 144 of the abrasive brush 120 through the workpiece edge 150. Rotation of the workpiece 122 about the workpiece edge 150 causes the point of contact between the [bristles 166] abrasive brush 120 and a top surface 166 and the side surface 168 of the workpiece 122 to vary, thereby controlling the resulting shape of the hone.--

On pages 11-12, the paragraph beginning "Referring back" has been rewritten as follows:

--Referring back to FIG. 8, an orientation actuator 160 is used to control the orientation of the workpiece 122 (*e.g.*, cutting tool) with respect to the abrasive brush 120. The orientation actuator 160 includes a fixed portion 160F and a rotary portion 160R. The fixed portion 160F is mounted to the base 132. The rotary portion 160R is rotatably engaged to the fixed portion 160F. The guides 136 are attached to the rotary portion 160R. The fixture 134, which holds the [work piece] workpiece 122, is slidably attached to the guides [130] 136. In order to rotate the workpiece, the orientation actuator 160 is controlled (*e.g.*, via a controller, such as controller 200 in FIG. 1) so as to rotate the rotary portion 160R. This, in turn, causes the guides 136 and the fixture 134 to rotate about an orientation axis of rotation 162. Depending on the location of the guides 136, fixture 134 and workpiece 122, the orientation axis may lie along the workpiece edge 150. Rotation of the workpiece 122 about this axis changes the angle δ between the side surface 168 and the radial line 170. As such, the point on the workpiece edge [122] 150 that contacts the abrasive brush 120 will vary.--

On page 13, the paragraph beginning "It is contemplated" has been rewritten as follows:

--It is contemplated that the position and orientation of the [work piece] workpiece within the volume of bristles and the speed of rotation of the abrasive brush can be altered during translation (*i.e.*, while the [work piece] workpiece is within the volume). This allows for the formation of a complex honed edge on the [work piece] workpiece and allows controlled variation of the hone along the workpiece edge. Referring to Figure 16 and Figures 17A-17C, for [For] example, there is shown [in forming] a threading tool[, the] 220 having a hone on the thread forming edge [can be intentionally] 222 that is varied from the tip end 224 to the base 226 of the thread forming edge of the tool. Referring to Figures 17A, it may desirable at [At] the tip end 224[, it may be desirable] to have a larger hone to permit the thread forming edge 222, when in use, to dig through the raw material. Conversely, at the base 226 of the thread

forming edge 222, shown in Figure 17B, it may be desirable to have a sharper hone to permit more precise finishing of the threads in the material. Figure 17C shows the hone formed at an intermediate point 228 along the thread forming edge 222. The present invention allows such precise hone control over the finished workpiece.--